E McMahon

Bulletin No. 114
May, 1927

TELETYPE

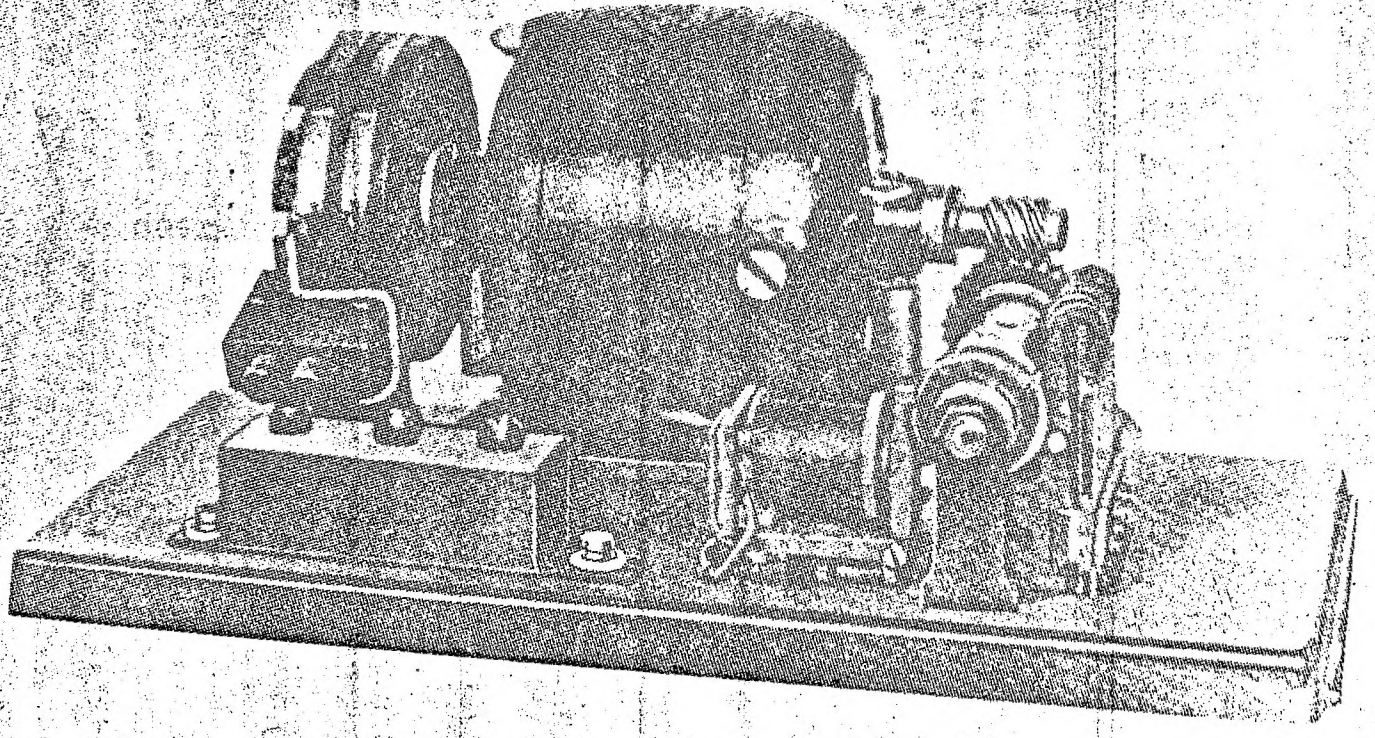
PRINTING TELEGRAPH SYSTEMS

DESCRIPTION AND ADJUSTMENTS OF KEYBOARD AND RECEIVING DISTRIBUTOR

(MODEL 12)

TELETYPE CORPORATION
SUBSIDIARY OF
Western Electric Company
CHICAGO, U.S.A.

Print... A.



I N D E X

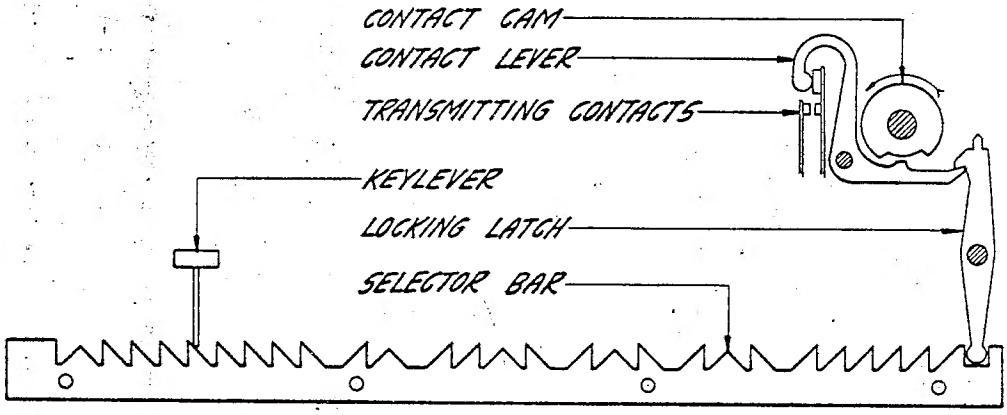


FIGURE 1.

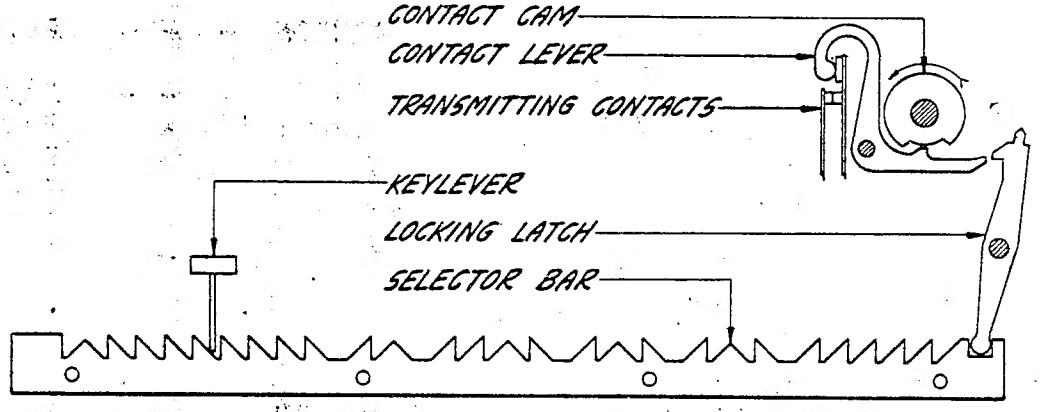


FIGURE 2.

MODEL 12 KEYBOARD AND RECEIVING DISTRIBUTORS

The Keyboard Distributor Unit and the Receiving Distributor Unit are motor driven "start-stop" contact controlling devices. The contacts are opened and closed by revolving cylinders.

On the Keyboard Distributor Unit, the transmitting contacts are under the control of the keyboard, while the receiving contacts distribute the incoming signals, received by the line relay, to the selecting magnets of the printer.

The Receiving Distributor Unit mechanism is identical with the receiving mechanism of the Keyboard Distributor Unit.

OPERATION OF THE KEYBOARD TRANSMITTING MECHANISM.

The transmitting mechanism is the sending part of the keyboard distributor unit, and consists of a set of keys, key levers, a bank of sending contacts, operating cams, gears, clutch and a driving motor. The motor is maintained at a constant speed by the regulating governor. The sending cams are driven by this motor through the medium of gearing and a clutch, the cams normally being held stationary. When a key is depressed, the driven member of the clutch is permitted to move into mesh with the driving member and the cams to revolve. At the end of the revolution the driven member of the clutch is disengaged and the cams brought to a stop until the next key is depressed.

Beneath the keylevers are five transverse selector bars and a universal bar extending across the width of the keyboard. The selector bars are provided with saw-tooth shaped notches as shown in Figure 1 according to the requirements of the signalling code. These bars rest on rollers and are guided at each end so that they may be easily moved endwise. When a key is depressed, the keylever strikes the slanting sides of these notches, moving the bars either to the right or the left, depending upon whether the impulses corresponding to the bars are to be open or closed circuit impulses.

The universal bar which is connected to the arm controlling the starting and stopping of the sending cams is pivoted at its two ends in such a way that the depression of any key moves it downward to actuate the starting arm. Thus, whenever a key is depressed, the selector bars are set and the universal bar moved downward permitting the sending cams to start rotating.

Each selector bar engages a vertical lever or locking lever at its right-hand extremity, and positions it to correspond with the signal impulses to be transmitted. Each locking lever controls the motion of a contact lever by either allowing the contact lever to close its contact when the cams revolve, or restricting the motion of the contact lever. If the upper end of the locking lever is positioned to the left, see Figure 1, corresponding to an open circuit (spacing) impulse, it engages the contact lever and prevents it from rising into the indent in the cam as it rotates, thus holding the circuit open for that impulse. However, if the locking lever is positioned to the right, see Figure 2, corresponding to the closed current

(marking) impulse, it does not interfere with the movement of the contact lever. Then as the cam revolves, the contact lever rides on the cam surface and rises into an indent, thereby closing its contacts and sending out a marking impulse. As the cams rotate, the impulses, either marking or spacing, are transmitted in succession. A sixth contact lever controls the start and stop impulses. This contact lever operates after each fifth impulse. At the end of the revolution the clutch driven member is cammed out of mesh with the driving member and prevents the cams from rotating further until the next key is depressed. A locking loop which is raised by a cam at the end of each revolution prevents any change in the selection set up, by holding the locking levers in their set positions while the signals are being sent out. This arrangement also makes it impossible to depress another key until the signal for the previous character has been transmitted.

OPERATION OF RECEIVING DISTRIBUTOR

The receiving distributor mechanism is found on both the keyboard distributor unit and on the receiving only distributor unit. On the keyboard distributor unit, the one motor serves for driving both the sending and the receiving cams.

The receiving distributor mechanism sorts out the line impulses received on the line relay and distributes them to the selecting magnets of the printer. To accomplish this, the motor drives thru the medium of gearing and a friction clutch, a drum having cam like depressions which control seven contacts. This cam drum is normally held from rotating by a stop arm engaging in a notch on the drum. This arm forms the armature of a magnet, known as the start-magnet, the energization of which releases the cam drum and allows it to rotate.

One of the seven contacts mentioned above is closed when the cam drum is in its normal or stopped position. This contact is connected in series with the start magnet. The other six contacts are normally open, five of them are in the circuit with the five printer selector magnets and the sixth, when operated, closes the circuit to a sixth pulse magnet in the printer.

When the start or open impulse is received, the tongue of the line relay touches its left contact (spacing) and completes the circuit through the normally closed distributor contact and the start magnet, which energizes the start magnet so as to remove the stop which holds the receiving cams from rotating. The cams rotate and the five selecting contacts are closed successively because of the contact levers entering the depressions in the cam drum. If the line signal is such that the tongue of the line relay is against its right (marking) contact when any selecting contact is closed a circuit will be completed through this contact to its corresponding selecting magnet in the printer. The selecting impulses received on the line relay are thus distributed through the contacts to the proper selecting magnets on the printer, thereby setting up a selection in the printer unit.

Further rotation of the cam drum then closes a contact which supplies a local impulse to the sixth pulse magnet in the printer, the operation of which magnet allows the printer mechanism to rotate and translate the selection set up. When rotation of the cam drum has been completed, the stop armature controlled by the start magnet engages its notch and prevents the cam from rotating further until the next start impulse is received.

LUBRICATION

Proper attention to lubrication is of the utmost importance. If the machine is properly lubricated in accordance with the following instructions, the period between lubrications can be set at one month for eight hour per day service. If the service is heavier than this the time between lubrications should be shortened in proportion, thus for twenty four hour service the printers should be lubricated three times per month.

Where grease is specified any good grade of medium cup grease may be used. Veedol medium cup grease has been found to be satisfactory.

For oiling, do not use very light oils such as typewriter oils or 3-In-1. These oils have not sufficient body. Oildag P-2 is especially recommended but any good light automobile motor oil such as Mobile Arctic or Veedol light may be used.

Apply oil to the following:

(1) Receiving clutch felt washers - pry the discs apart with a screw driver and saturate the felts.
(2) Receiving shaft bracket bearings - front and rear.
(3) Receiving cam cylinder - oil hole.
(4) Stop armature screw bearing.
(5) Receiving cylinder - oil hole.
(6) Transmitting shaft front bearing - oil cup.
(7) Transmitting shaft rear bearing.
(8) Idler gear screw bearings.
(9) Clutch lever pawl - pivot.
(10) Trip off pawl - pivot.
(11) Clutch Lever - two bearings.
(12) Locking loop - two pivots.
(13) Locking loop roller - one pivot.
(14) Lockout levers - five bearings.
(15) Contact levers - one drop of oil on side of each lever placed so that it will run down on pivot bearing.
(16) Rear keylever bearing.
(17) Tip keyboard back. Put drop of oil on each universal bar pivot and on each selector bar roller, also put drop of oil on each keylever just in front of selector bars.

Apply grease to the following:

(1) To the five gears and motor worm.
(2) Trace of grease on surface of each cam of transmitting cam cylinder and on receiving cam cylinder.
(3) Fill motor grease cups.

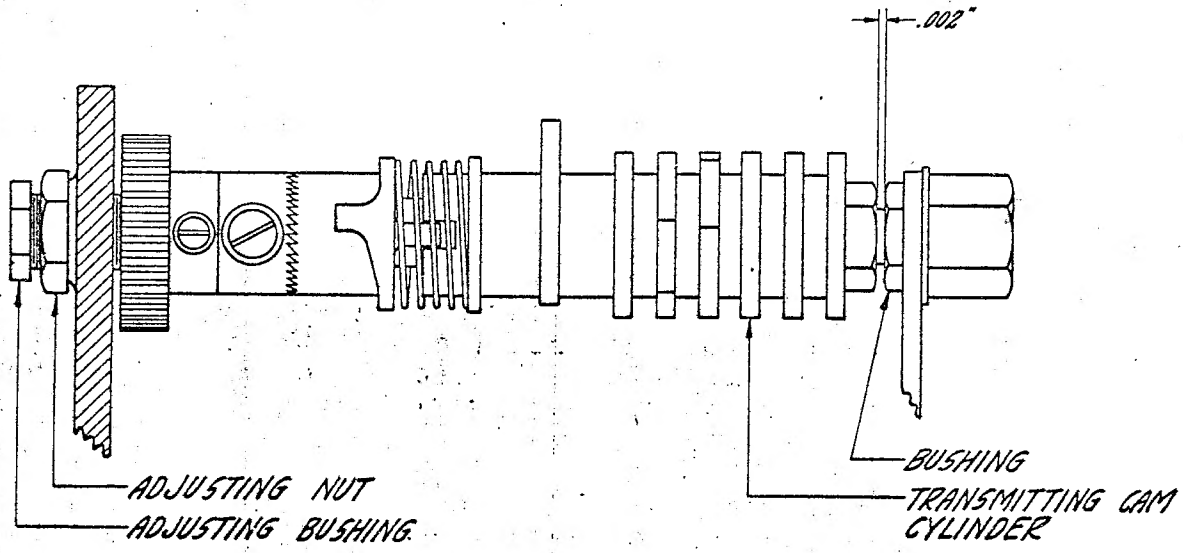


FIGURE 3.

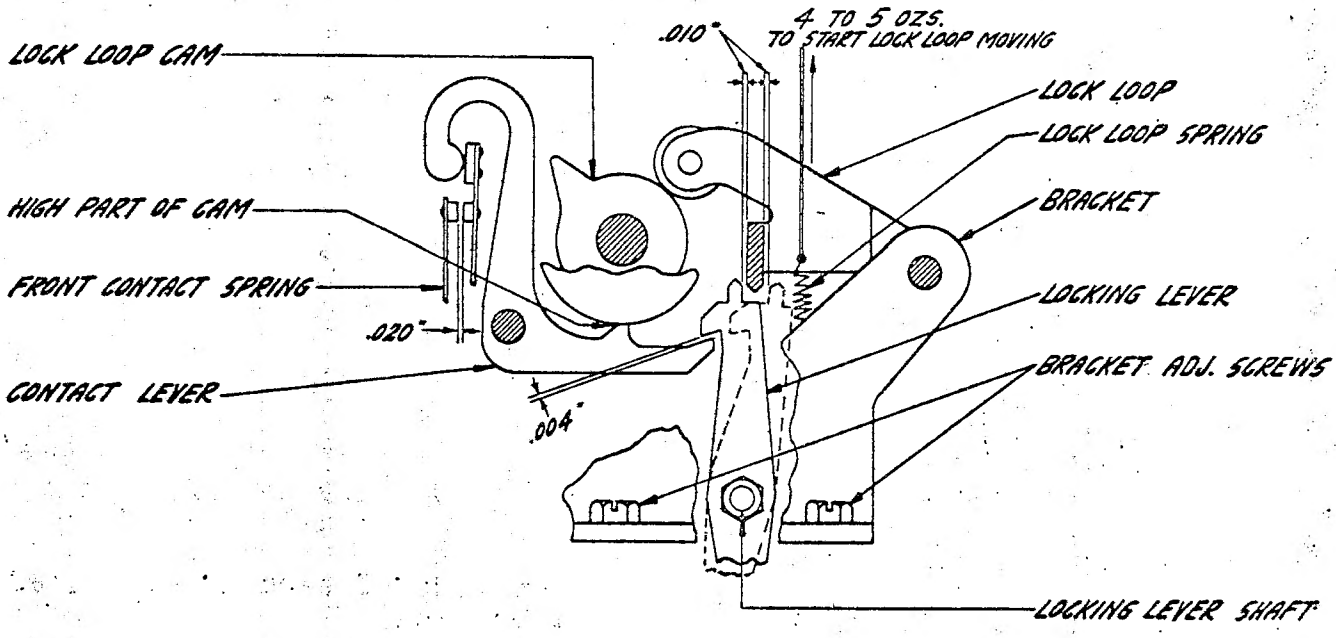


FIGURE 4.

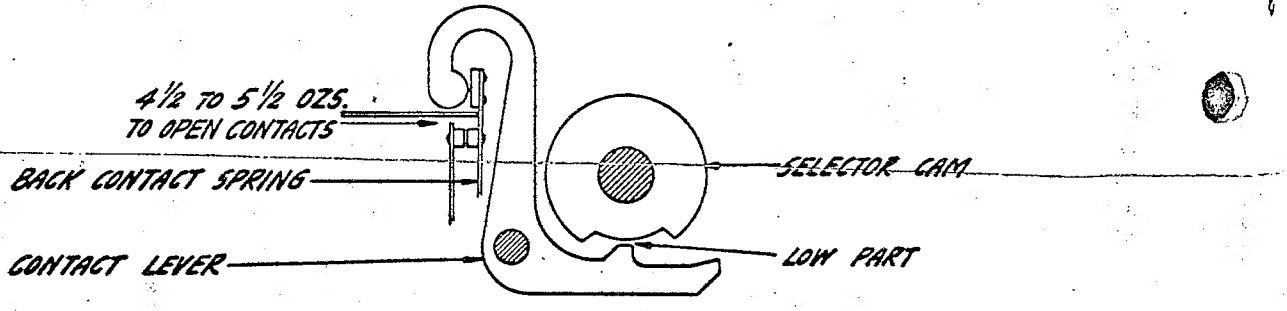


FIGURE 5.

KEYBOARD DISTRIBUTOR UNIT ADJUSTMENTS

TRANSMITTING CAM CYLINDER END PLAY, FIGURE 3

Loosen the nut of the transmitting shaft adjusting bushing and turn the bushing to give .002" play between the cam cylinder and the bracket.

LOCK LOOP SPRING, FIGURE 4

With lock loop roller resting on low part of its cam it should require from 4 to 5 ounces to just start lock loop moving, pulling in line with the spring.

LOCKING LEVER SHAFT, FIGURE 4

When the contact levers are riding on the high parts of their cams and the locking levers are on the spacing side (left of the lock loop) adjust position of locking lever shaft so that there is .004" space between the contact levers and the locking levers.

LOCKING LEVERS, FIGURE 4

Depress the "letters" key and rotate the transmitting shaft until lock loop roller rests on the low part of its cam. When in this position there should be at least .010" clearance between any locking lever finger and the lock loop blade.

There should be the same clearance when the "Blank" key is depressed.

This adjustment can be made by loosening the four screws which hold the main bracket and shifting bracket.

CONTACT GAPS, FIGURE 4.

With the contact lever on the high part of cam the contact gap should be .020". Bend front contact spring to obtain this.

CONTACT TENSIONS, FIGURE 5.

With the contact lever in the indent of its cam the back contact spring should be adjusted so that it will require a tension of from 4 1/2 to 5 1/2 ounces to just open contacts.

Re-check contact gaps after setting spring tensions.

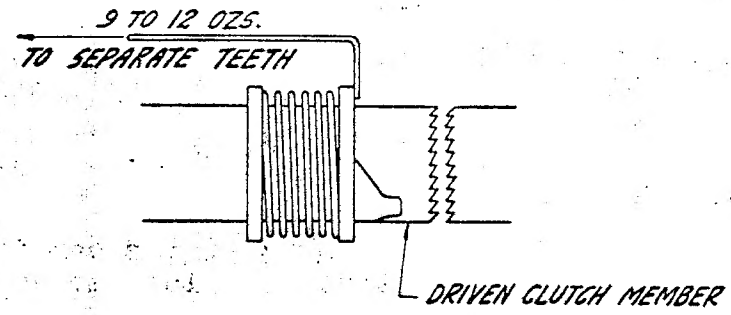


FIGURE 6.

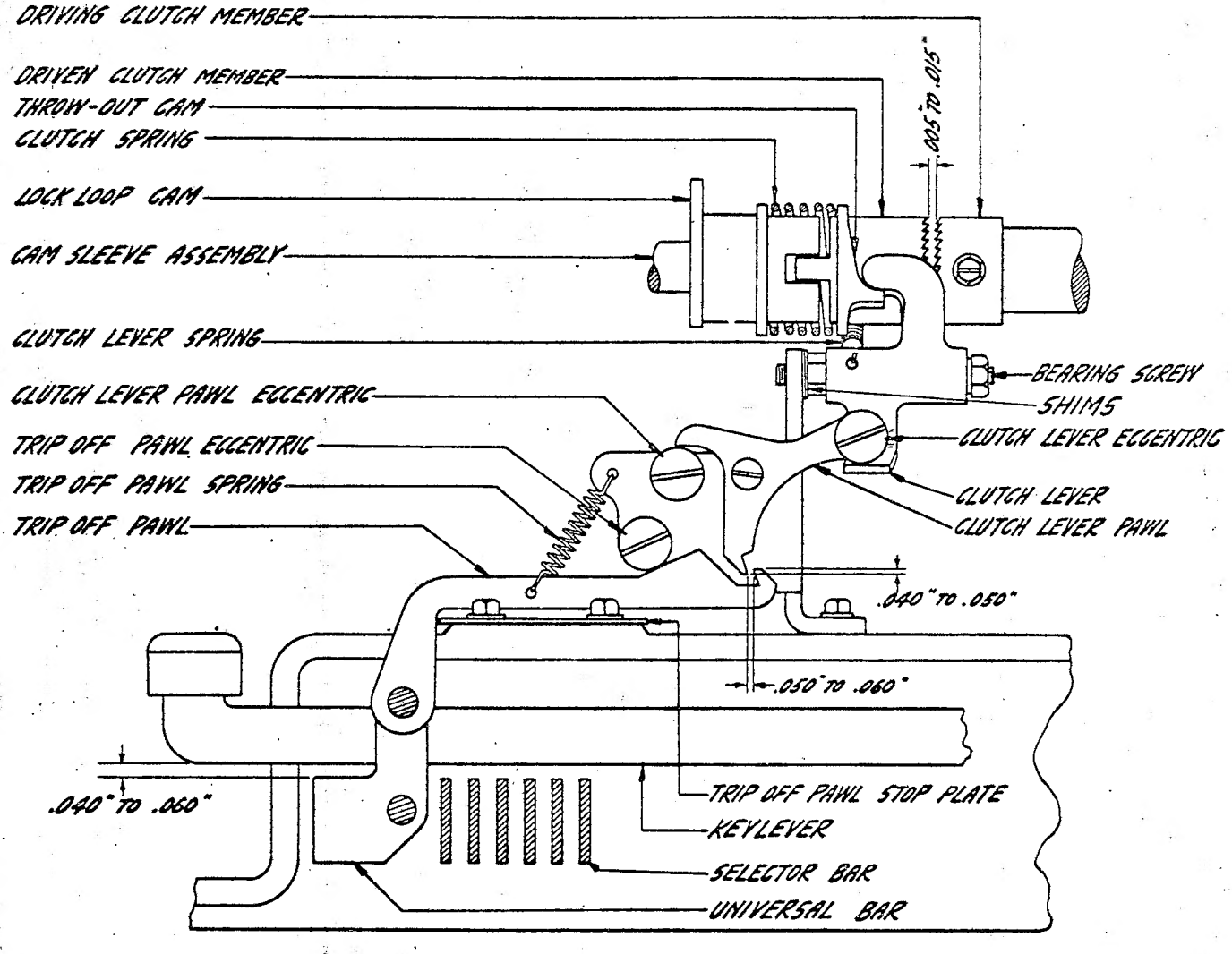


FIGURE 7.

CLUTCH SPRING, FIGURE 6.

It should require from 9 to 12 ounces to separate clutch teeth. Hook scale to driven member projection and pull directly in line with shaft.

CLUTCH ADJUSTMENT, FIGURE 7.

Adjust position of clutch lever by means of shims so that when the clutch is fully disengaged there is from .005" to .015" clearance between clutch teeth.

NOTE: The next four adjustments must be made in the order given.

TRIP OFF PAWL STOP PLATE, FIGURE 7.

Adjust the position of the trip off pawl stop plate so that there is from .040" to .060" clearance between the keylevers and the universal bar. Try all keylevers from this clearance.

CLUTCH LEVER PAWL ECCENTRIC, FIGURE 7.

Adjust eccentric so that there is from .050" to .060" space between the trip-off pawl and the clutch lever pawl when the trip-off pawl is resting against the stop plate.

TRIP-OFF PAWL ECCENTRIC, FIGURE 7.

Adjust the trip-off pawl eccentric so that the notched part of the trip-off pawl overlaps the clutch lever pawl by from .040" to .050".

CLUTCH LEVER ECCENTRIC, FIGURE 7.

Loosen the clutch lever eccentric and turn it until the clutch lever rests on the low part of the clutch driven member. With the clutch lever in this position adjust the clutch lever eccentric so that the clutch lever pawl is held firmly between the clutch lever pawl eccentric and the clutch lever eccentric.

CLUTCH LEVER SPRING

Hook an 8 ounce scale over spring hole in clutch lever and pull in line with spring. It should require from 1 1/2 to 2 1/2 ounces to just start lever moving.

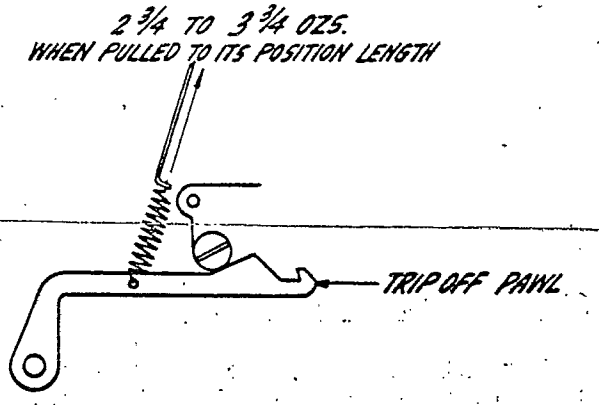


FIGURE 8.

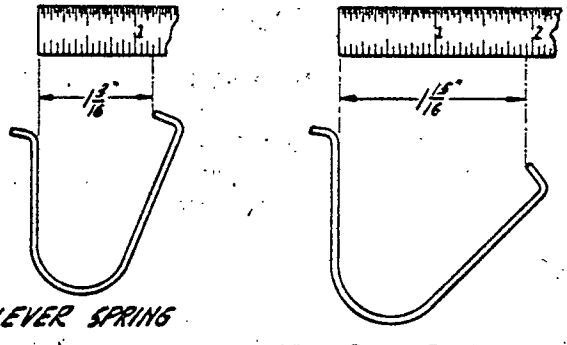


FIGURE 9.

TRIP-OFF PAWL SPRING, FIGURE 8.

Unhook spring and with 8 ounce scale pull to its position length. It should measure from 2 3/4 to 3 3/4 ounces.

KEYLEVER SPRING, FIGURE 9.

The openings between the ends of all keylever springs, excepting spacer keylever, should measure 1 3/16".

SPACER KEYLEVER SPRING, FIGURE 9.

The spacer keylever spring should measure 1 15/16" across the opening between the ends.

CONVERTING KEYBOARD TO GIVE REPEAT ACTION

Where it is desired, the Keyboard may be modified so that when a key is held depressed, the signals for that character or function will be sent out repeatedly until the key is released. This is sometimes useful for continuous spacing or line-feeding and slightly increases the actual speed of the keyboard.

The keyboard is modified to provide this repeat action by removing the trip-off pawl eccentric from the plate to which it is fastened and adding washers under the heads of the screws which mount the trip-off pawl stop plate so that the added washers will project under the trip-off pawl to prevent it from moving downward and disengaging from the clutch lever pawl. These washers (#41663) will be found under the heads of the two brace screws on the transmitter shaft front bracket. One or more washers may be required to make the adjustment referred to.

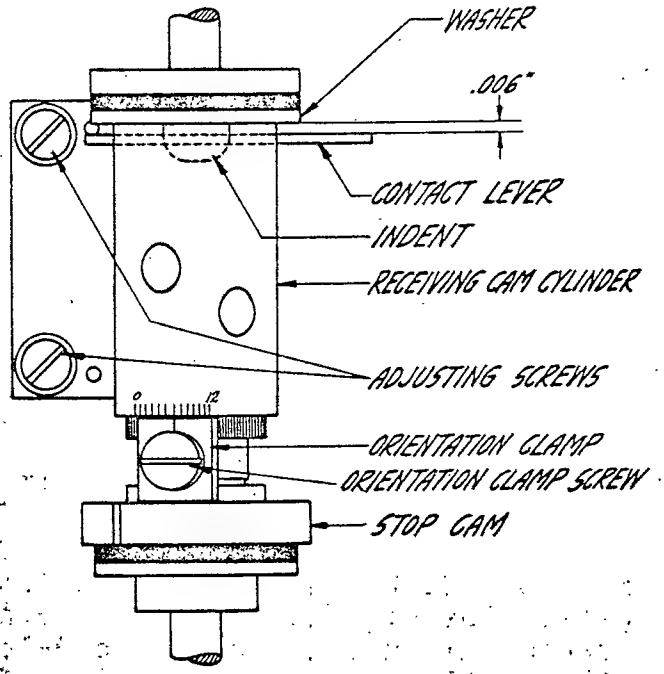


FIGURE 10.

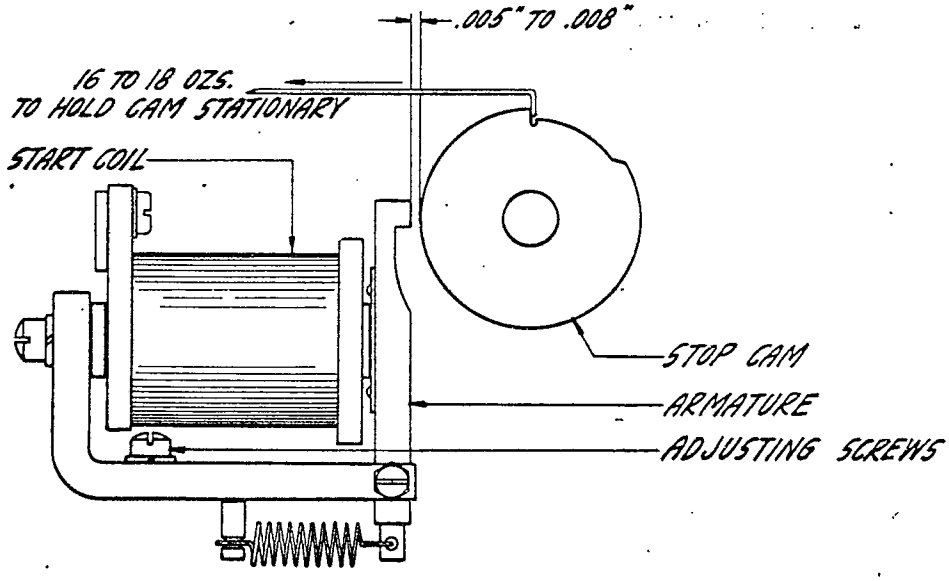


FIGURE 11.

RECEIVING DISTRIBUTOR ADJUSTMENTS

CONTACT LEVER ADJUSTMENT, FIGURE 10.

The contact levers must ride through the center of the cam cylinder indents. Loosen the two screws of the contact bracket assembly, and shift the bracket. There must be at least .006" space between the 6th pulse contact lever and the steel washer at the end of the cam cylinder.

CONTACT GAPS

With the contact lever on the high part of the receiving cam cylinder, adjust the front contact spring to give an opening of .010" between the contact points. (In the same manner as shown in Fig. 4 of the Keyboard Transmitter Adjustments).

CONTACT TENSIONS.

Rotate the cam cylinder until the contact lever is in the bottom of the indent. Pressing against the back contact just above the contact point, it should require from 4 1/2 to 5 1/2 ounces to just open the contacts. Bend the back contact spring to secure this tension. Re-check the contact gap after making this adjustment. (See Fig. 5 of Keyboard Transmitter Adjustments).

CLUTCH TENSION, FIGURE 11.

The receiving cam cylinder is revolved by a friction drive, the discs of which are made of hard felt, and are located at the ends of the cylinder. These discs should not be permitted to become glazed and should be kept soaked with oil. A pull of from 16 to 18 ounces should be required to stop the rotation of the cam cylinder. With motor running, hook a spring balance into the slot in the stop cam and pull against the direction of rotation of the cylinder.

START MAGNET ADJUSTMENT, FIGURE 11.

The start magnet should set so that the face of the armature is parallel to and bears evenly against the face of the stop cam. With the armature held firmly against the start magnet, there should be a clearance of from .005" to .008" between the face of the stop cam and the edge of the hook on the armature. Both these adjustments are made by moving the start magnet bracket.

The start magnet must be removed to make the adjusting screws accessible. If the armature isn't positioned correctly in respect to the stop cam there will be a tendency of the armature to fail to latch or to slip off.

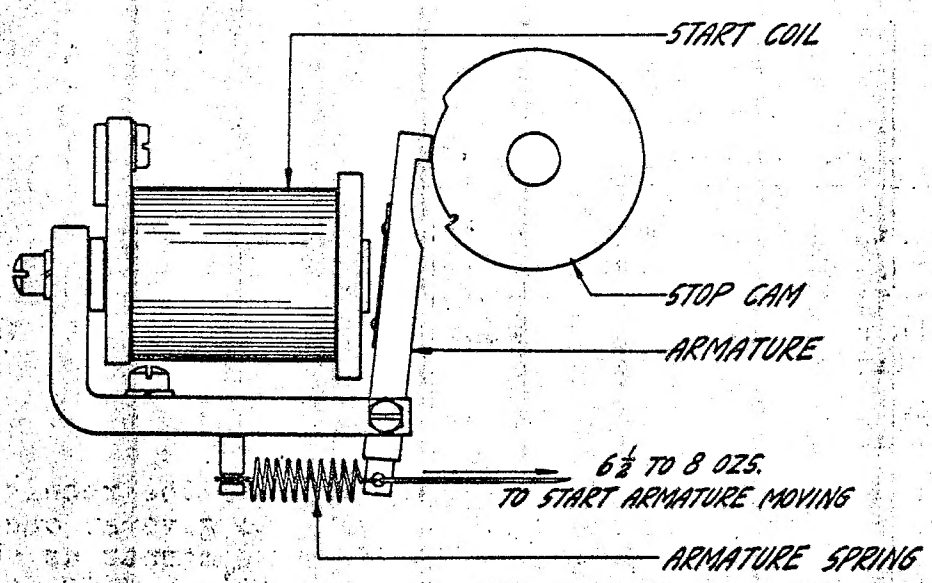


FIGURE 12.

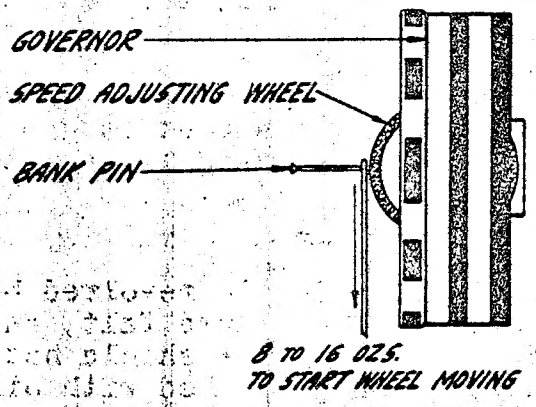


FIGURE 13.

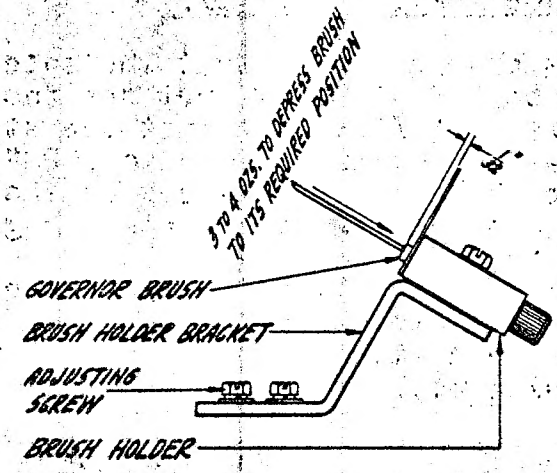


FIGURE 14.

START MAGNET ARMATURE SPRING TENSION, FIGURE 12

To measure the armature spring tension, hook the spring balance at the spring hole of the armature and pull horizontally. With the armature in low part of cam, it should require from 6 1/2 to 8 ounces to move the armature.

GOVERNOR ADJUSTMENTS

SPEED ADJUSTING WHEEL, FIGURE 13.

To measure the tension of the speed adjusting wheel spring, insert a bank pin in the leather rim (radially) and hook a 32 ounce spring balance to the pin, making sure that the hook is against the leather rim. Pulling at right angles it should require from 8 to 16 ounces to just start moving the wheel.

ADJUSTING SCREW GUIDE PIN.

The adjusting screw guide pin should be so bent that when the riveted end of the pin is jammed against the adjusting wheel the other end of the pin is held securely in the guide groove by one half of its thickness.

GOVERNOR BRUSH SPRINGS, FIGURE 14.

The required tension to depress the brush spring to its operating length, that is, to within 1/32" of the brush holder, shall not be more than 4 ounces and not less than 3 ounces.

The pigtails should be soldered to both the carbon brush and the brass insert of the brush screws.

GOVERNOR BRUSHES POSITION.

Adjust the position of the brush holder bracket so that the brushes project not more than 1/32" beyond holder. Be sure that the brushes ride on the center of collector rings. Elongated mounting holes are provided in the bracket to make it adjustable.

SPEED SETTING.

The tuning fork supplied is used for the purpose of regulating the motor speed. The fork is equipped with shutters attached to the ends of the tines.

On the rim of the motor flywheel is attached a speed target of alternate black and white spots.

Tap the fork lightly - just enough to start it vibrating - a sharp

blow may cause the shutters to buckle. Hold the fork close to the eye and view the moving spots on the flywheel through the shutters. If the spots appear to be moving in the direction of rotation, the motor speed is too high. The speed is too low if the spots appear to move in a direction opposite to that of rotation. The speed is correct when the spots seem to be stationary. The motor speed may be decreased by pressing the hand against the outside surface of the moving flywheel. This causes the adjusting wheel to be moved in such a way as to decrease the tension of the governor armature, thereby slowing down the motor.

The speed may be increased by repeating the same performance on the inside of the flywheel. This will increase the tension of the governor armature spring and speed up the motor.

ORIENTATION RANGE

Before taking an orientation range the adjustments of the line relay and the distributors should be checked and the speed should be very carefully set. After this has been done, "RY" (the letters "R" and "Y" sent alternately) should be sent continually from the distant station while the range is being taken. The setting should not be made by testing on the local test circuit because the current through the relay windings under this condition is less than when on the line which may result in a slightly erroneous setting.

The high extreme of the range is limited by the closing of the sixth pulse contacts, which in most cases occurs when the indicating mark on the clamp is at the end of the seventh division (reading the divisions on the cam cylinder from left to right), so the setting must be made with respect to the lower extreme.

Loosen the receiving cam cylinder clamping screw (See Fig. 10) and shift the cam cylinder in a clockwise direction to a point where errors occur in the "RY". Then move the cylinder in a counter-clockwise direction very carefully to a point where the "RY" prints perfectly. This will be the lower extreme of the range. Note the position on the cam cylinder scale. Now move the cylinder to a point where the sixth pulse contacts just are about to close when the stop cam is in its stopped position. If the "RY" comes in perfectly with the cylinder in this position, the high limit cannot be found. The final setting in such cases must be made with respect to the lower limit, that is, the cylinder must be set 2 1/2 divisions to the right of the lower limit, on high speed operation (360 operations per minute) and 1 1/4 divisions to the right on low speed operation (210 operations per minute). The setting for intermediate speeds should be in like proportion.

If the line signals become biased or vary sufficiently to cause errors, the lineup of the line circuit should be corrected rather than the orientation setting changed to accommodate the defective signal.

For certain special cases, where the signals have a definite tendency to be biased to marking or to spacing, it may be necessary to make a special adjustment by receiving signals from all sending stations on the circuit under average conditions, measuring the range of orientation and making a setting to accommodate best the various sending stations.